DIVIDENDS FROM WOOD RESEARCH

Recent Publications of the
Forest Products Laboratory
July 1 to December 31, 1968
Forest Service
U.S. Department of Agriculture

302909

1.
PRESS DRYING NINE SPECIES OF WOOD

by M. E. Hittmeier, G. L. Comstock, and R. A. Hann.
Forest Prod. J. 18(9):91-96, Sept. 1968.

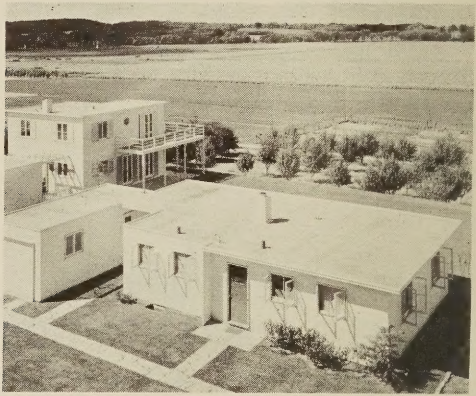
Seasoning wood in minutes instead of days, weeks, or months--that's the potential of press drying as demonstrated in experiments with nine species.

Green half-inch boards were dried to 6 percent moisture content or less in 25 to 75 minutes, inch-thick boards in 100 to 200 minutes. And the boards came out of the press flat and more dimensionally stable in width than kiln-dried stock. Some darkening, attributed to heating of extractives, in many instances improved appearance.

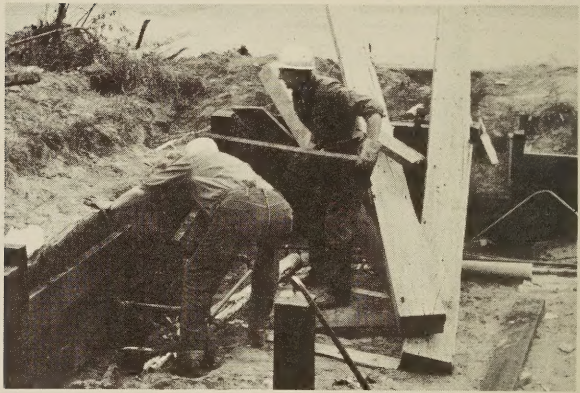
Degrade consisting of checks, honeycomb, and collapse occurred mainly in the heartwood of refractory species and was more severe in the 1-inch boards. For paneling and similar uses, however, such degrade is considered acceptable. Species least degraded in either thickness were sweetgum, blackgum, baldcypress, and ash. Only white oak and post oak showed major degrade at both thicknesses. Species that dried without severe degrade had strength, gluing, and machining properties like those of kiln-dried wood.

Press drying consists of applying heat to both faces of a board through steam-heated press platens under pressure of 25 to 75 pounds per square inch. Fluted cauls let vapor escape, and screens above and below the boards restrain shrinkage in width.

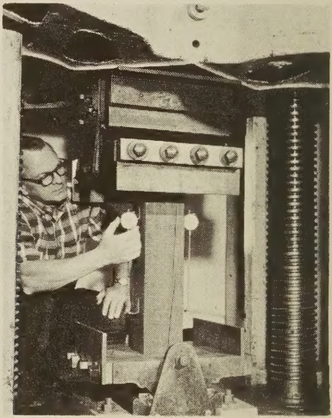
THE HOUSE



THE FOUNDATION



THE RESEARCH



2.
HOUSE FOUNDATION OF TREATED WOOD AFTER 30 YEARS SERVICE

by B. A. Bendtsen and W. E. Eslyn.
U.S. Forest Serv. Res. Paper FPL 98, 10 pp., Aug. 1968.

A creosoted wood foundation was still "giving excellent service and effectively meeting its requirements" 30 years after it was built for an experimental house, a meticulous examination of its posts and planks revealed when the house was moved and the foundation dismantled.

The foundation enclosed a crawl space several feet deep under the basementless house, a prototype stressed-skin structure pioneered by FPL scientists and erected in 1937. The southern pine planking walled off the ground and was nailed to the Douglas-fir posts, which supported the house.

The foundation's good performance, while not unexpected, occurred despite treatment with creosote preservative that varied from substandard to very good. Creosote retention in the planks was consistently low, yet decay had penetrated at most only about 1/4 inch. The cause was identified as a class of fungi, called soft rotters, that is creosote-tolerant but very slow-acting.

Creosote retention in the Douglas-fir posts ranged from 1.2 to 12.8 pounds per cubic foot. Well treated posts showed no evidence of decay, poorly treated ones considerable. Overall, however, strength of the posts was not significantly reduced.

ITEMS FOR FREE DISTRIBUTION are numbered, and available from the Forest Products Laboratory while the supply lasts. To request publications simply circle the appropriate number on the back cover of this list, detach, and mail to the Laboratory. Blanket requests for publications cannot be filled.

Publications marked with an asterisk (*) are not available at the Laboratory. They may be consulted at most college and public libraries, or obtained from the publisher.

Reports of slight interest to the layman are designated "Highly technical."

Other recent FPL publications

FINISHING

3. Water-repellent preservatives, by Forest Products Laboratory. U.S. Forest Serv. Res. Note FPL-0124, 7 pp., Aug. 1968.

Presents recommendations on the use of water-repellent preservatives as a pretreatment for wood to improve painting and as a natural finish for exterior wood. Also gives formula for a typical water-repellent solution that can be made at home.

* PEG is the sweetheart of the wood craftsman, by Harold L. Mitchell. U.S. Dept. of Agric. Yearbook, 1968; Science for better living, pp. 147-149.

Describes how a small cottage-type woodworking industry has benefited from research conducted by the Forest Products Laboratory. Problems of properly seasoning the local hardwoods have been largely solved through the use of polyethylene glycol-1000 to prevent splitting and checking of bowls, serving trays, and other craft items.

GLUES AND GLUED PRODUCTS

4. Gluing fire-retardant-treated Douglas-fir and western hemlock, by R. E. Schaeffer. U.S.D.A. Forest Serv. Res. Note FPL-0160, 16 pp., Nov. 1968.

An evaluation of the effects of fire-retardants on the rate of gelation of a resorcinol-resin adhesive and on the quality of resorcinol-resin joints of treated and untreated Douglas-fir and western hemlock. (Highly technical)

5. Long term durability of laboratory-made Douglas-fir flakeboard, by R. W. Jokerst. U.S. Forest Serv. Res. Note FPL-0199, 17 pp., July 1968.

An evaluation of the performance of eight types of Douglas-fir flakeboards exposed to laboratory-controlled and outdoor conditions.

6. Stress-strain behavior of films of four adhesives used with wood, by William T. Simpson and Vernon R. Soper. U.S. Forest Serv. Res. Note FPL-0198, 19 pp., July 1968.

Mechanical properties of thermosetting and thermoplastic polyvinyl-acetate adhesives and a resorcinol resin adhesive are evaluated and compared for use in designing adhesive joints for wood.

* Parameters for determining heat and moisture resistance of a urea-resin in plywood joints, by Robert H. Gillespie. Forest Prod. J. 18(8):35-41, Aug. 1968.

An evaluation of the effects of heat and moisture on the loss of clear strength of a hot-press urea-resin adhesive in plywood-type joints. The effect of moisture was the major factor determining the durability of the urea-resin-bonded joints. (Highly technical)

MECHANICAL PROPERTIES

7. Thermal insulation from wood for buildings: Effects of moisture and its control, by W. C. Lewis. U.S. Forest Serv. Res. Paper FPL 86, 44 pp., July 1968.

Kinds of thermal insulation from wood are described, their design values are given, and the requirements for proper design are discussed. Methods are presented for estimating heat flow, fuel savings, and temperatures. Effects of moisture as influenced by insulation and cold weather are discussed.

8. Longtime performance of trussed rafters: Initial evaluation, by T. L. Wilkinson. U.S. Forest Serv. Res. Paper FPL 93, 12 pp., July 1968.

Preliminary results of study of longtime performance of trussed wood rafters with various connection systems. Describes test equipment and procedure, destructive evaluation of control rafters and initial deflections of rafters being subjected to longtime loading.

9. Properties of No. 2 Dense kiln-dried southern pine dimension lumber, by D. V. Doyle. U.S. Forest Serv. Res. Paper FPL 96, 24 pp., July 1968.

Provides data on strength and related properties of No. 2 Dense kiln-dried dimension lumber and matched clear specimens of southern pine from 10 locations.

10. Some nondestructive parameters for prediction of strength of structural lumber, by Ivan Orosz. U.S.D.A. Forest Serv. Res. Paper FPL 100, 7 pp., Oct. 1968.

Suggests structural lumber grading variables and functions that are capable of better strength predictions than strength ratio or modulus of elasticity alone.

11. Strength evaluation of round timber piles, by T. L. Wilkinson. U.S.D.A. Forest Serv. Res. Paper FPL 101, 44 pp., Dec. 1968.

Strength properties in compression parallel to grain and bending were determined for Douglas-fir, southern pine, and red oak timber piles. The effect of kiln drying of southern pine piles on crushing strength was investigated. The results should be useful in developing timber pile specifications. (Highly technical)

* Seasoning factors for modulus of elasticity and modulus of rupture of 4-inch lumber, by C. C. Gerhards. Forest Prod. J. 18(11):27-35, Nov. 1968.

Compared to green beams of the same size, 4-inch-thick southern pine beams kiln dried to 12 percent moisture content average 23 percent higher in MOE and depending on strength ratio from 0 to over 50 percent higher in MOR.

* Static and dynamic strength and elastic properties of ponderosa and loblolly pine, by William L. James. Wood Science 1(1):15-22, July 1968.

Earlier data on dynamic mechanical properties of hardwoods is extended to softwoods, with similar results. It is shown that linear viscoelasticity is not applicable to wood. (Highly technical)

* Effect of temperature on readings of electric moisture meters, by William L. James. Forest Prod. J. 18(10): 23-31, Oct. 1968.

The three principal types of electric moisture meters were used on wood over a temperature range from 0° to 200° F. Existing temperature corrections for resistance-type meters were confirmed, and corrections for capacitive-admittance and power-loss types were derived.

12. Effects of type of testing equipment and specimen size on toughness of wood, by C. C. Gerhards. U.S. Forest Serv. Res. Paper FPL 97, 12 pp., July 1968.

Combined results of several studies showed that toughness values determined with the FPL toughness testing machine average higher than those for comparable material determined with the Amsler Universal wood testing machine. In general, FPL machine values may be assumed to be 16 percent higher than Amsler machine values. (Highly technical)

13. Forest Products Laboratory list of publications of interest to architects, builders, engineers, and retail lumbermen, by Forest Products Laboratory. Nov. 1968.

A partial listing of literature available on the use of wood as a construction material, particularly as applied to houses and other light-frame construction.

PACKAGING

14. Effects of vertical dynamic loading on corrugated fiberboard containers, by W. D. Godshall. U.S. Forest Serv. Res. Paper FPL 94, 20 pp., July 1968.

Effects of transportation vibration in top-to-bottom stacking strength of corrugated fiberboard containers. Outlines factors involved, develops safe dynamic loading limits for a typical container, and determines influence of fatigue on container failure.

15. Performance of nailed cleats in blocking and bracing applications, by R. S. Kurtenacker and W. D. Godshall. U.S.D.A. Forest Serv. Res. Note FPL-0200, 11 pp., Aug. 1968.

Design criteria were developed for various combinations of nails, cleats and floorboards for one species of wood in a simulated railcar switching environment. The study establishes the resistance of nailed cleats to rapidly applied lateral forces. An applicable method for laboratory evaluation was developed.

* Tests give film barriers the air, show how well they do, by A. A. Mohaupt. Package Engineering 13(12):80-84, Dec. 1968.

Desiccated packages were stored in open sheds at two locations to determine the actual periods of protection which were compared to calculated periods using weather data for the locale. The most practical method of estimating the protection period involved 30-year average monthly conditions. Three factors that influenced the accuracy for estimating were geographic location, starting time, and length of protection.

PERFORMANCE OF WOOD IN FIRE

16. A simplified test for adhesive behavior in wood sections exposed to fire, by E. L. Schaffer. U.S. Forest Serv. Res. Note FPL-0175, 15 pp., Nov. 1968.

Describes a test to evaluate behavior of various adhesives near fire-exposed surfaces in laminated constructions. Included are results obtained on six adhesives in two wood species.

* Wood can protect you from fire, by Herbert W. Eickner. U.S. Dept. of Agr. Yearbook of Agriculture, 1968: Science for better living, pp. 321-324.

The performance and use of untreated wood as a fire-resistive building material is described. For those applications where decreased flammability is essential, fire-retardant treatments of wood by chemical impregnation and by paint coatings are also discussed.

PHYSICAL PROPERTIES

17. Effect of restrained swelling on wood moisture content, by William T. Simpson and Christen Skaar. U.S. Forest Serv. Res. Note FPL-0196, July 1968.

Describes how restraining wood from swelling is related to time for maximum swelling, temperature, and moisture content. (Highly technical)

18. Effect of transverse compressive stress on loss of wood moisture, by William T. Simpson and Christen Skaar. U.S. Forest Serv. Res. Note FPL-0197, 7 pp., July 1968.

Describes how transverse compressive stress is related to moisture content of wood and suggests that stress is of significance in moisture movement in wood. (Highly technical)

* The relationships between permeability of green and dry eastern hemlock, by Gilbert L. Comstock. Forest Prod. J. 18(8):20-23, Aug. 1968.

A consistent relationship was found to exist between the permeability of green heartwood to water and its permeability to nitrogen gas after drying. Permeability of heartwood decreases with increasing moisture content in the hygroscopic range. Sapwood undergoes a drastic sporadic reduction in permeability during drying. (Highly technical)

* Thermodynamics of water sorption by wood, by C. Skaar and William Simpson. Forest Prod. J. 18(7):49-58, July 1968.

A fundamental review of water sorption and thermal properties of wood from a thermodynamic point of view. (Highly technical)

19. Changes in wood microstructure through progressive stages of decay, by W. Wayne Wilcox. U.S. Forest Serv. Res. Paper FPL 70, 49 pp., July 1968.

A detailed study of the sequence of microscopically recorded changes in a softwood and a hardwood undergoing decay by a typical white-rot fungus (Polyporus versicolor L.) and a brown-rot fungus (Poria monticola Murr.). (Highly technical)

SAWING AND MACHINING

20. Effect of precompression on sliced wood 1/2 and 1 inch in thickness, by C. C. Peters and R. R. Zenk. U.S. Forest Serv. Res. Note FPL-0194, 12 pp., July 1968.

Based on measurements of checks and thickness variability of slices, precompression had little effect on quality of slice when chestnut oak and Douglas-fir blocks were sliced 1/2 and 1 inch thick using a modified milling machine. (Highly technical)

* Multiple-flitch method for thick slicing, by Curtis C. Peters. Forest Prod. J. 18(9):82-83, Sept. 1968.

The fracturing near the ends of 1-inch-thick sliced material was greatly reduced by backing up one flitch with another. This multiple-flitch concept could result in increased production without the need of high cutting speeds. (Highly technical)

STRUCTURE AND GROWTH CONDITIONS

21. Survey of specific gravity of eight Maine conifers, by Harold E. Wahlgren, Gregory Baker, Robert R. Maeglin, and Arthur C. Hart. U.S. Forest Serv. Res. Paper FPL 95, 12 pp., July 1968.

Specific gravities by average and range are determined from mass increment core sampling for each of eight coniferous species of Maine.

22. A literature survey of Populus species with emphasis on P. tremuloides, by Dimitri Pronin and Coleman L. Vaughan. U.S. Forest Serv. Res. Note FPL-0180 Revised, 68 pp., Aug. 1968.

Bibliography covers Populus sp. with emphasis on P. tremuloides. References have been grouped under broad subject matter headings to facilitate use and are arranged alphabetically by author within each group.

* Stem anatomy variation in cottonwood growing under nutrient-deficient conditions, by A. N. Foulger and J. Hacskaylo. Proc. of the Eighth Lake States Forest Tree Improvement Conference Sept. 12-13, 1967. U.S. Forest Serv. Res. Paper NC-23, 1968, pp. 41-47. North Central Forest Experiment Station, St. Paul, Minn.

In first-year cuttings of eastern cottonwood the amount of wood formed was reduced, and the stem anatomy altered with deficiencies of boron, nitrogen, phosphorus, potassium, or sulphur. Fiber length and width, vessel width, ring width, bark width, and pith diameter all were reduced by varying amounts. (Highly technical)

* Root and shoot initiation in aspen callus cultures, by Karl E. Wolter. Nature 219(5153):509-10, Aug. 3, 1968.

Describes the plant growth hormones necessary for organogenesis on aspen callus, grown in vitro. Emphasis is on the auxin cytokinin interactions. (Highly technical)

* Factors contributing to heartwood-boundary stain in living oak, by Erwin H. Bulgrin and James C. Ward. Wood Science 1(1):58-64, July 1968.

Discoloration at the heartwood boundary can occur in vigorous oak trees with clear stems. This investigation indicates that two distinct subgroups of stain may be present. Some soil and site characteristics may be helpful in identifying these trees. Concentrations of stain may be associated with interaction between main branches and roots. (Highly technical)

23. Trends of fibril angle variation in white ash, by Charlotte H. Hiller, U.S.D.A. Forest Serv. Res. Paper FPL 99, 13 pp., Sept. 1968.

Reports the variation of the fibril angle within the trunk of a fast-grown white ash and the association of the fibril angle with ring width, fiber length, radial fiber diameter, and fiber wall thickness. (Highly technical)

* Walnut wood characteristics in relation to soil-site conditions, by R. R. Maeglin, N. D. Nelson, and H. E. Wahlgren. Proc. of the Eighth Lake States Forest

Tree Improvement Conference Sept. 12-13, 1967. U.S. Forest Serv. Res. Paper NC-23, 1968, pp. 37-40. North Central Forest Experiment Station, St. Paul, Minn.

Reports how the U.S. Forest Products Laboratory is attempting to find one or more wood quality criteria for black walnut. Wood quality attributes outlined are color, extractives, specific gravity, anatomical characteristics, shrinkage, machining characteristics, and mechanical properties. Methods for testing are detailed.

WOOD CHEMISTRY

24. List of publications on the chemistry of wood, by FPL. Sept. 1968.

Includes publications that give general information and results of research by the U.S. Forest Service on the analysis, chemical and physical properties, and conversion processes of wood and wood products.

* Degradation of the lignin model compound syringylglycol-β-guaiacyl ether by Polyporus versicolor and Stereum frustulatum, by T. Kent Kirk, John M. Harkin, and Ellis B. Cowling. Biochimica et Biophysica Acta 165(1968):145-163.

Another lignin model was used to investigate how wood-rotting fungi degrade lignin by oxidation. Breakdown of this compound was effected by phenol-oxidizing fungal enzymes that caused cleavage of carbon-to-carbon bonds, producing simpler aldehydes, carboxylic acids, and quinones on the one hand, and condensed humus-like structures on the other. (Highly technical)

* Detection of petroleum oil diluents in coal tar creosote by thin layer chromatography, by W. E. Moore, M. J. Effland, and H. G. Roth. J. of Chromatography 35(4):522-525, Dec. 17, 1968.

A thin-layer chromatographic method was developed for the detection of petroleum oils used as diluents on creosote. The presence of oils can be demonstrated down to a level of 0.25 percent in the creosote. This technique should be useful in other applications where differentiation between aromatics and hydrocarbons is desired. (Highly technical)

* Importance of penetration and adsorption compression of the displacement fluid, by R. C. Weatherwax and Harold Tarkow. Forest Prod. J. 18(7):44-46, July 1968.

The apparent density of wood substance is greater in polar than in nonpolar liquids. As much as 85 percent of the difference is due to the ability of the polar liquids to penetrate void structures inaccessible to nonpolar liquids. The remainder is due to compression of the adsorbed polar liquids. (Highly technical)

* On questioning the X-ray evidence of crystallizability of xylan in situ, by Daniel F. Caulfield. Tappi 51(8): 371-372, Aug. 1968.

The correct interpretation of the X-ray data does not substantiate the hypothesis of crystallization of xylan in situ. It is definitely shown that a spurious reflection which occurs at 31° in certain X-ray photographs is not a xylan reflection but a Kβ reflection from cellulose. (Highly technical)

* Oxidation of guaiacyl- and veratryl-glycerol-β-guaiacyl ether by Polyporus versicolor and Stereum frustulatum, by T. Kent Kirk, John M. Harkin, and Ellis B. Cowling. Biochimica et Biophysica Acta 165(1968): 134-144.

To test the theory that lignin is decomposed by micro-organisms via an ether-splitting enzyme that depolymerizes lignin by hydrolysis, two models were incubated with wood-rotting fungi and the metabolic products examined. These gave no indication of an ether-hydrolyzing enzyme but revealed only oxidative transformations of the test compounds. (Highly technical)

* Surface densification of wood, by Harold Tarkow and Raymond Seborg. Forest Prod. J. 18(9):104-7, Sept. 1968.

A procedure is described for continuously densifying the surface region of a board. The density can be made to grade down from about 1.0 gram per milliliter to normal density for the species with 0.1 inch from the surface. Abrasion resistance is increased 10-20 fold. (Highly technical)

WOOD DRYING

* Producing check-free beech for turnings, by R. C. Rietz and J. A. Jenson. Forest Prod. J. 18(11):42-44, Nov. 1968.

The effectiveness of presurfacing green beech squares or drying the stock as rounds for reducing surface checking was investigated. By presurfacing, surface checking was reduced from 31.2 inches per 3-foot specimen for rough-sawed squares to 16.4 inches per presurfaced square. Kiln-drying rounds reduced surface checking to 11.4 inches per specimen.

WOOD FIBER

* Fiber for tomorrow's requirements, by Gardner H. Chidester. Tappi 51(8):46A-47A, Aug. 1968.

Presents today's process problems and those relating to future requirements for paper emphasizing utilization and cost of available raw materials including saw-mill waste, improving pulp yields, reducing water and air pollution and capital costs, process control, and research.

* Progress and prospects of polysulfide pulping, by Necmi Sanyer. Tappi 51(8):48A-51A, Aug. 1968.

Polysulfide reactions are reviewed and related to the high sulfur requirement, rate of delignification, mechanism of carbohydrate protection, and yield increase. Development of an effective recovery furnace having a separate oxidation and reduction section with built-in air pollution abatement feature is proposed. (Highly technical)

* Application of chemicals to wet webs of paper and linerboard using the smoothing press, by D. J. Fahey. Indian Pulp & Paper 23(1):85-92, July 1968.

Smoothing press applications of starch, starch-pigment mixtures, or phenolic resins resulted in stronger printing papers and linerboards without adversely affecting air resistance. These treatments were accomplished without loss of chemicals. (Highly technical)

* Resin treatments for improving dimensional stability of structural fiberboard, by P. E. Steinmetz and D. J. Fahey. Forest Prod. J. 18(9):82-83, Sept. 1968.

Application of water-soluble phenolic resin to surfaces of the wet mat improved linear and thickness stability with changes in moisture and flexural strength of structural hardboard. (Highly technical)

* Sodium sulfite recovery by the direct oxidation of smelt, by James W. Rice and Necmi Sanyer. Tappi 51(7): 321-327, July 1968.

NSSC and kraft smelts were crushed and subjected continuously to humid air to oxidize the sulfide to sulfite. Conversions were over 80 percent with mill smelts and 90 percent with synthetic smelts. Direct oxidation is attractive for NSSC operation integrated with a kraft recovery system. (Highly technical)

GENERAL

* Utilizing all species and all of the tree, by H. O. Fleischer. The Northern Logger and Timber Processor 17(2):18, 64-65, 74, Aug. 1968.

Pulpwood industry goal of using the whole tree is thoroughly explored in a paper presented at the recent annual American Pulpwood Assn. meeting.

CONTENTS